

CURRICULUM VITAE

Mercedes Paniccia

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PERSONAL DATA

Born: *March 21, 1975; Priverno (LT) - Italy* **Nationality:** *Italian*
Occupation: *Postdoctoral Researcher*
Employer: *INFN (Italian National Institute for Nuclear Physics Research)*
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EDUCATION

- April 2, 2008** *Doctorat ès Sciences, mention Physique (6/6)*
Université de Genève, Genève, Switzerland
Subject: Experimental Particle Physics
Dissertation: *“Search for time-dependent fluctuations in cosmic ray flux with the AMS-01 detector and construction of the AMS-02 detector”* - Uni. Genève PhD Thesis N° 3963
Defence date: March 31, 2008
Committee:
Prof. Martin Pohl (advisor), Prof. A.G.Clark, (Université de Genève);
Prof. E.O.Flueckiger, (Universität Bern);
Dr. S.Gentile, (Università degli Studi di Roma “La Sapienza”).
- Feb.2003 to Mar.2008** PhD student at Université de Genève, Genève, Switzerland
- January 30, 2003** *Laurea in Fisica summa cum laude (110/110 e lode)*
Università degli Studi di Roma “La Sapienza”, Roma, Italy
Subject: Experimental Particle Physics
Dissertation: *“Search for supersymmetric Higgs boson at LHC with the ATLAS detector”*
Advisor: Dr. Simonetta Gentile
- Sep.1996 to Jan.2003** undergraduate student at Università degli Studi di Roma “La Sapienza”, Italy
- July 1994** *High School Leaving Certificate with full marks*
(“Diploma di Maturità Scientifica” : 60/60)
Liceo Scientifico Statale - Informatics section, Priverno (LT), Italy
- Sep.1989 to Jun.1994** student at Liceo Scientifico Statale - Informatics section, Priverno (LT), Italy

LANGUAGES

Mother tongue Italian
Foreign languages English: fluent in speaking, excellent in reading and writing
French: excellent in speaking and reading, good in writing

TECHNICAL TRAINING AND EXPERIENCE

2003 CERN Technical Training course: *CLEAN-2002: Working in a cleanroom*
2003 to 2005 Assembly of silicon detectors for the AMS-02 Tracker
in high class cleanrooms.

COMPUTING TRAINING AND EXPERIENCE

Software Training *Object-Oriented Software Analysis and Design with C++* (30h) 2002
Experience C++, C, FORTRAN, PASCAL, XML, HTML
Operating System: Linux, Microsoft Windows, Mac OS X
Analysis Tools: ROOT, PAW
Word Processing: LaTeX, WORD, PowerPoint

SCHOOLS

2005 CERN-CLAF School of High Energy Physics (2 weeks)
(Malargüe, Argentina)
2004 *Astroparticules et Cosmologie* (1 week)
Deuxieme Seminaire Transalpin de Physique (Dolomieu, France)
2003 *Payload and mission definition in Space Science* (2 weeks)
XV Canary Islands Winter School of Astrophysics (Puerto de la Cruz - Tenerife, Spain)

SCHOLARSHIPS

June 2002 to Sept. 2002 Partecipation at the CERN Summer Student Programme

Research project: “*Describing ATLAS detector with AGDD*”

Offline software development for the ATLAS Muon Spectrometer
Detector Description Database and implementation of related docu-
mentation in the ATLAS Muon Spectrometer web page.

Supervisor: Dr. Steven Goldfarb (University of Michigan)

July 2001 Scholarship for undergraduated students from Università degli Studi
di Roma I “La Sapienza” for a research experience abroad.
*I have used this grant to spent three months at CERN, from March 2002
to May 2002, to start up the research project for my diploma thesis.*

TEACHING EXPERIENCE: Teaching Assistant

- 2005-2007 Exercices de Physique Générale**
Université de Genève - Physics Departement
- 2003-2005 Travaux Pratiques Élémentaires**
Université de Genève - Physics Departement
- 2003 Travaux Pratiques Avancés - Physique Nucleaire**
Université de Genève - Physics Departement

RESEARCH EXPERIENCE

Apr 2008 to present: Postdoc, Laboratori Nazionali di Frascati dell'INFN (LNF)

Development of the automatic nuclear-emulsion scanning system and event reconstruction for the hybrid system emulsions-electronic detectors of the OPERA experiment.

I am working in the OPERA (CNGS1) neutrino oscillation experiment as responsible for the LNF nuclear-emulsion scanning laboratory. The OPERA detector, designed to directly observe the ν_τ appearance from ν_μ to ν_τ oscillation in the CNGS long baseline beam from CERN to the underground Gran Sasso Laboratory (LNGS) in Italy, has collected an initial sample of neutrino events in the 2007, 2008 and 2009 runs. The topology reconstruction of the neutrino interaction vertex is crucial for the ν_τ appearance identification. Neutrino interactions occurs in the OPERA target, which is composed by 150000 bricks made of nuclear emulsion films interleaved with lead plates. Electronics detectors allow to reconstruct the charged particles produced in the interaction and so to identify the bricks where the interaction occurred. The selected bricks are extracted from the target and shared among the various nuclear-emulsion scanning laboratories in Japan, Switzerland and Italy, where the neutrino interaction vertex reconstruction and the event analysis are performed. The LNF scanning laboratory is equipped with two automatic nuclear emulsion scanning microscopes. My starting task has been the completion of the setting up of the scanning system for both hardware and software aspects (microscopes optics, camera and motors controllers settings, upgrade of the scanning hardware and software). Then I have successfully performed the preliminary measurements needed to validate the LNF scanning system, that is the scanning efficiency measurement on nuclear emulsions exposed to pions beam at CERN, and the localization of the neutrino interaction vertex in an OPERA brick previously scanned and analysed in another scanning laboratory. Consequently the LNF OPERA group has joined the nuclear emulsion scanning and analysis activities of the experiment. Since then I am running the LNF scanning laboratory. My current activity consists in performing the scanning of the OPERA event bricks assigned to the LNF laboratory, analysing the resulting emulsion scanning data, producing the precise localization of the neutrino interaction vertex and the reconstruction of the event topology, and finally publicating the relevant emulsion scanning data and the results on the localized event on the global OPERA scanning database where the data from the all

scanning laboratories are collected and made available to the Collaboration for further analysis.

Feb 2003 to Mar 2008: Ph.D Student, Université de Genève

Search for time-dependent fluctuations in cosmic ray flux with the AMS-01 detector and construction of the AMS-02 Silicon Tracker detector. (PhD Thesis)

AMS is a magnetic spectrometer to be installed on the International Space Station to perform precise cosmic rays measurements, direct antimatter searches and indirect dark matter searches. The core of the AMS detector is a Silicon Tracker inserted into a toroidal magnet. In 1998 a prototype detector, AMS-01, was flown on board the NASA Space Shuttle Discovery. Though this was an engineering flight to test the possibility of operating such a detector in space, analysis of the data collected led to significant physics results on rates and spectra of charged cosmic rays in a near Earth orbit, and antimatter and dark matter searches were performed. The construction of the AMS-02 detector started soon after the AMS-01 flight. From 2003 to 2005 I have had a primary role in the AMS-02 Silicon Tracker production activities at Université de Genève, taking care of the quality control and performance tests of the detector modules, and of the coordination of the production chain at Université de Genève. As PhD thesis research project I have carried out an analysis of the AMS-01 data to search for time-dependent fluctuations in charged cosmic rays spectra. The solar activity is known to influence the cosmic-ray flux on Earth up to energies of 50 GeV per nucleon. The AMS-01 detector is sensitive to the highest energy range of solar particle events. I have searched systematic flux fluctuations for the main cosmic-ray components (protons, helium nuclei and electrons) in the energy range accessible to the AMS-01 detector (from 100 MeV per nucleon to 200 GeV per nucleon) for the time interval for which suitable AMS-01 data are available (from June 8 to June 12, 1998). I have observed systematic variations of cosmic-ray flux in the energy range below the geomagnetic cutoff. By comparing these results to the geomagnetic activity of the time, I have found a correlation between systematic flux decreases and magnetic disturbances of solar origin. This analysis is the subject of an AMS Internal Note (**AMS-NOTE-2008-08-01**), which is on the way to be submitted to Physics Letter B for publication as an AMS Collaboration paper.

Jan 2002 to Jan 2003: Undergraduate Student, Università di Roma “La Sapienza”

Search for supersymmetric neutral Higgs h in the decay $\rightarrow \mu\mu$ with the ATLAS detector. (Tesi di Laurea)

As Diploma thesis project I have studied the possibility of observing the neutral scalar Higgs boson h of the Minimal Supersymmetric extension of the Standard Model in the channel $pp \rightarrow b\bar{b}h \rightarrow b\bar{b}\mu\mu$. The MSSM parameter space, in the maximal mixing scenario, accessible to the ATLAS detector via this channel together with the discovery potential have been obtained analysing Montecarlo samples produced with the “fast simulation” package of the ATLAS detector, which is based on parametrizations of the detector performance. I have focussed on the study of the reliability of the “fast simulation” approach for the $h \rightarrow \mu\mu$ channel, comparing the h search performances of the ATLAS detector resulting from the analysis of two distinct Montecarlo sam-

ples produced with the detailed simulation and with the “fast simulation” packages respectively. The results have been reported in the ATLAS Internal Note **ATL-PHYS-2003-013**.

Summer 2003: CERN Summer Student

Offline software development for the ATLAS Muon Spectrometer Detector Description Database.

This work has been part of the development process of one of the possible ATLAS Detector Description databases, the ATLAS Generic Detector Description (AGDD) database, needed by the offline software to get the detector description. The base language for AGDD is XML, while C++ interfaces provide access to the geometrical objects and their attributes. I have implemented the description of part of the inert material embedded in the ATLAS Muon Spectrometer detector in the AGDD language.

TALKS AND SEMINARS

- Sep. 2009** **The neutrino interactions localization with the OPERA experiment.**
XCV National Congress of Italian Physical Society
(Bari, Italy)
- Oct. 2007** **The Alpha Magnetic spectrometer on the International Space Station**
The 10th ICATPP Conference on Astroparticle, Space Physics,
Detectors and Medical Applications
(Villa Olmo - Como, Italy)
- Feb. 2007** **The Alpha Magnetic Spectrometer on the International Space Station**
The Swiss Physical Society Annual Meeting
(Zürich, Switzerland)
- Sep. 2006** **Dark Matter searches with AMS-02**
The 2nd Symposium on Neutrinos and Dark Matter in Nuclear Physics
(Paris, France)
- Jun. 2004** **The AMS-02 Tracker**
Third International Workshop on Frontier Science 2004:
Physics and Astrophysics in Space
(Villa Mondragone - Monteporzio Catone, Roma, Italy)

LIST OF PUBLICATIONS

Primary contribution papers:

- * **Correlation of Time-dependent Fluctuations in Cosmic Ray Flux with solar activity.**
M.Paniccia and M.Pohl.
Geneva, 15 Aug 2008 - 21pp.
AMS Internal Note: **AMS-NOTE-2008-08-01**.

- * **The Alpha Magnetic Spectrometer on the International Space Station.**
M.Paniccia on behalf of the AMS Collaboration
Published in *Astroparticle, Particle and Space Physics, Detectors and Medical Physics Applications*
Proceedings of the 10th Conference (Villa Olmo - Como, Italy), 8-12 Oct. 2007.
World Scientific, Singapore, 2008.
- * **The AMS-02 Tracker.**
M.Paniccia, Jun. 2004 - 6pp.
Published in *Rome/Frascati 2004, Physics and Astrophysics in Space* 83-88
- * **Search for supersymmetric neutral Higgs h in the decay $\rightarrow \mu\mu$ in ATLAS detector.**
S.Gentile, M.Paniccia, P.Violini.
Geneva: CERN, 15 Apr 2003 - 36pp.
ATLAS Internal Note: **ATL-PHYS-2003-013**

Collaboration papers:

- * **Measurement of the atmospheric muon charge ratio with the OPERA detector.**
N.Agafonova et al.[The OPERA Collaboration], 2010
Accepted for publication in *EPJC*
e-Print:[arXiv:1003.1907v1](https://arxiv.org/abs/1003.1907v1)[hep-ex], 9 March 2010
- * **The detection of neutrino interactions in the emulsion/lead target of the OPERA experiment.**
N.Agafonova et al.[The OPERA Collaboration], 2009
Published in *JINST* 4 P06020, 2009
- * **The OPERA experiment in the CERN to Gran Sasso neutrino beam.**
R.Acquafredda et al.[The OPERA Collaboration], 2009
Published in *JINST* 4 P04018, 2009
- * **The Alpha Magnetic Spectrometer Silicon Tracker: Performance results with protons and helium nuclei.**
J.Alcaraz et al.[The AMS-02 Tracker Collaboration], 2008
Published in *Nucl.Instrum.Meth.* A593:376-398, 2008,
Erratum-ibid.A597:270,2008
- * **Charge determination of nuclei with the AMS-02 silicon tracker.**
B.Alpat et al.[The AMS-02 Tracker Collaboration], 2005.
Published in *Nucl.Instrum.Meth.* A540:121-130, 2005

LIST OF REFEREES

Dr. Simonetta Gentile

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Prof. Martin Pohl

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Dr. Lucia Votano

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